



Early Journal Content on JSTOR, Free to Anyone in the World

This article is one of nearly 500,000 scholarly works digitized and made freely available to everyone in the world by JSTOR.

Known as the Early Journal Content, this set of works include research articles, news, letters, and other writings published in more than 200 of the oldest leading academic journals. The works date from the mid-seventeenth to the early twentieth centuries.

We encourage people to read and share the Early Journal Content openly and to tell others that this resource exists. People may post this content online or redistribute in any way for non-commercial purposes.

Read more about Early Journal Content at <http://about.jstor.org/participate-jstor/individuals/early-journal-content>.

JSTOR is a digital library of academic journals, books, and primary source objects. JSTOR helps people discover, use, and build upon a wide range of content through a powerful research and teaching platform, and preserves this content for future generations. JSTOR is part of ITHAKA, a not-for-profit organization that also includes Ithaka S+R and Portico. For more information about JSTOR, please contact support@jstor.org.

THE MATHEMATICAL TRAINING OF GIRLS IN GERMANY.

By CARRIE BUTZ.

The present system of secondary schools for girls in Prussia is comparatively new. It may be said to date from August, 1908, with slight modifications in February, 1912, as to terminology.

Before 1908, provision had been made for the establishment of higher girls' schools and normal schools, but little for the further training of girls after completing the higher school.

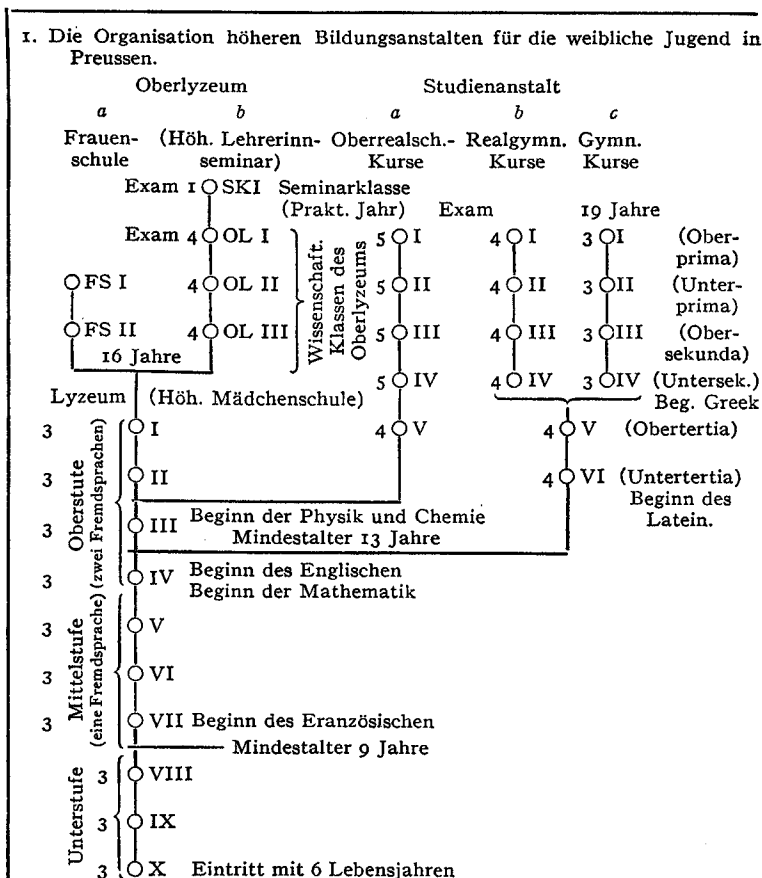
It is true that the Prussian government through the famous regulations, May 31, 1894, über das Mädchenschulwesen, die Lehrerinnenbildung und die Lehrerinnenprüfung, had prescribed a nine years' course and special elective courses for the education of girls after the completion of this course, but these regulations were not adequate to meet the wants and needs for the proper education of girls. Almost nothing was done for the future housewife and mother, or for the girl who desired to go to the university.

Before 1908, teaching conditions were not regulated and it was difficult to secure the best teachers for girls' schools. The Prussian government, however, in 1908, decreed that the higher girls' school be placed officially under the control of the Provincial School Board and that the Direktors and Oberlehrer who taught at these schools should take equal rank (salaries and pensions) with the Direktors and Oberlehrer of boys' schools. It also decreed that the course be changed from nine to ten years and that one half of the periods in the academic subjects of the upper and middle grades be taught by university trained teachers. The girls' schools were thus put on the same basis as the boys' schools.

The higher girls' school or Lyzeum, as termed by the provision of February, 1912, has ten classes designated by X (the lowest) to I (the highest) as shown in the accompanying sketch

or table. The minimum age at which a girl may enter the lowest class is six years. At nine she begins French, at twelve, the study of English and of mathematics as distinguished from Rechnen, to which time is given during the first six years.

The work for the different classes of the Lyzeum is as follows:



Classes X–VIII (av. age 6 to 8).—Mental reckoning with numbers from 1 to 1,000. Written exercises in the four fundamental operations and easy examples in the rule-of-three.

Class VII (av. age 9).—The four fundamental operations. German weights, measures and money. Practice in writing

decimals. Easy examples in decimals and in the rule-of-three. Reduction of easy fractions from higher to lower terms.

Class VI (av. age 10).—Decimals continued. Divisibility of numbers. Greatest common divisor and least common multiple. Common fractions and familiarity with the more common solids.

Class V (av. age 11).—Decimal fractions. Simple and compound proportion. Percentage and interest. Introduction of algebraic symbols for arithmetical numbers. Simple problems in surfaces and solids.

(In the seventh school year mathematics begins.)

Class IV (av. age 12).—Addition, subtraction, multiplication and division of algebraic quantities. Simple equations of the first degree with one unknown quantity. Propaedeutic work in plane geometry. Most important properties of triangles. Learning of definitions and forms.

Class III (av. age 13).—Division and fractions (algebraic numbers). Factoring. Equations of the first degree. Constructions. Triangles, and the parallelogram and trapezoid.

Class II (av. age 14).—Equations of the first degree with two unknown quantities. Graphic representation of the function of the first degree. Proportion. The circle. The measurements of rectilinear figures and the theorem of Pythagoras.

Class I (av. age 15).—Square root of numbers. Simple equations of the second degree with one unknown quantity. Graphic representation of these functions. Regular polygons. The circumference and area of the circle. Calculation of volume and surface of simple solids.

After completing the ten years' course in the Lyzeum, the girl who wishes may enter the Frauenschule for two years. Her work here is such as to fit her to take care of a home and includes no mathematics. The girl who wishes to prepare to teach, may enter the academic classes of the Oberlyzeum for three years. She continues her work in mathematics for four hours each week for three years and finishes with a Seminar Klasse or Practical Year.

O L III (age 16-17).—Theory of powers, roots and logarithms.

Equations of the second degree. Similarity. Proportion. Constructions with algebraic analysis.

O L II (age 17-18).—Arithmetical and geometrical series. Interest and annuities. Equations of the second degree with two unknown quantities. Introduction to the study of harmonic points, pencils and transversals. Trigonometry.

O L I (age 18-19).—Review. Binomial theorem for positive integral exponents. Stereometry.

Practical year (age 19-20).—Methods of teaching and introduction to the literature of the subject. The fundamentals of plane analytical geometry.

Should the girl desire a university education, she could enter one of the three Studienanstalten or University Preparatory Schools.

The Oberrealschule affords more opportunity for mathematics and science and may be entered after eight years in the Lyzeum. Physics and chemistry are begun in class III of the Lyzeum and then five years would be spent doing the work of the Oberrealschule. At nineteen years of age the girl would be ready to enter the University. (The Arabic numerals to the left of any course in the sketch indicate the number of hours per week devoted to mathematics.)

Should the girl desire less science and more of the languages, she would leave the Lyzeum at the end of the first seven years and enter the Realgymnasium, if she wanted Latin but no Greek, or the Gymnasium, if she desired to study both Latin and Greek.

MATHEMATICS OF THE OBERREALSCHULE.

Class V (age 14-15).—Equations of the first degree with several unknown quantities. Proportion. Square root. Easy equations of the second degree with one unknown quantity. The circle. Measurement of rectilinear figures.

Class IV (age 15-16).—Theory of powers, roots and logarithms. Equations of second degree with one and two unknown quantities. Similarity. Regular polygons. The circumference and area of the circle. Trigonometry of triangles and polygons.

Class III (age 16-17).—Equations of the second degree with two and more unknown quantities. Arithmetical and geo-

metrical series. Interest and annuities. Trigonometry. Stereometry with special reference to the elements of projection. Harmonic points, pencils, transversals. Axes of symmetry.

Classes II and I (age 17-19).—Equations of the third degree. Binomial theorem for any exponent. The most important series. Maxima and minima. Combinations and their application. A complete review of all works. Constructions with algebraic analysis. Conic sections, a synthetic and analytic treatment. Spherical trigonometry, sufficient to be able to understand mathematical geography.

MATHEMATICS OF THE REALGYMNASIUM.

Class VI (age 13-14).—Division and fractions of algebraic numbers. Factoring. Equations of the first degree. The triangle, parallelogram and trapezoid.

Class V (age 14-15).—Equations of the first degree with two or more unknown quantities. Graphic representation of functions of the first degree. Simple theorems of proportion. Square root. Easy equations of the second degree with one unknown quantity. The circle. Measurement of rectilinear figures.

Classes IV-I (age 15-19).—Same as that of the Oberrealschule, only four hours per week devoted to the study of mathematics instead of five, and conic sections are treated only analytically.

MATHEMATICS OF THE GYMNASIUM.

Classes VI and V (age 13-15).—Same as the Realgymnasium.

Class IV (age 15-16).—Theory of powers, roots logarithms. Similarity. Regular polygons. Measurement of the circumference and area of the circle.

Class III (age 16-17).—Equations of the second degree with two unknown quantities. Transversals, harmonic points and pencils. Trigonometry of the triangle.

Classes II and I (age 17-19).—Arithmetical and geometrical series. Interest and annuities. Binomial theorem for positive integral exponents. Complete review of all previous work. Stereometry. Fundamentals of the conic sections.

At the completion of the university preparatory courses, the girl must pass an examination. Five hours are given to the written examination, which may be divided into two parts of two and one half hours each. The written examination is followed a few weeks later by an oral examination. The best pupils may be excused from the oral examination providing their classwork and written examination has been meritorious. The same regulations as to examinations apply to those who have completed the three academic years of the Oberlyzeum.

EXAMINATION QUESTIONS GIVEN AT THE REALGYMNASIUM
AT CASSEL.

1. Determine the roots: $x^4 + 4x^3 - 13x^2 - 4x + 12 = 0$; discuss methods used.

2. What is the coefficient of $x^{n-r}y^r$ in the expansion $(x - \frac{1}{2}y)^n$, when n is the third term of a geometrical series of six terms, the sum of whose even terms is 147, and the sum of whose odd terms is $73\frac{1}{2}$? r is the number of terms of an arithmetical series, the first term of which is 5, the common difference 3, and the sum is 98.

3. Determine the distance between Vienna (lat. $48^\circ 12' 36''$, longitude $34^\circ 2' 36''$) and Paris (lat. $48^\circ 50' 11''$, long. 20°). Determine the remaining parts of the spherical triangle.

4. Determine the equation and the area of a circle which passes through the point 4, 3, and is externally tangent to the circle, $(x-2)^2 + y^2 = 1$ and also tangent to the axis of ordinates.

(This is not any specially selected list of questions but the first set of a number mentioned by Dr. Schröder.)

The courses for girls in Saxony, Bavaria, Hesse, Baden and other parts of Germany, follow, in the main, the work as prescribed for the girls' schools of Prussia.

They all give ten years to the Lyzeum and all provide for the further training of girls, either in Frauenschulen or university preparatory schools, or both. In most countries, girls, at the age of nineteen, are ready to enter the university. In Baden the Oberrealschule at Mannheim takes the girl after six years in the Lyzeum and in six years more prepares her for the University. She is then eighteen years old. This is done by devoting

from five to seven hours a week to mathematics during the last six years. During the last two school years the work is as follows:

Unterprima (age 16-17).—Combinations. Binomial theorem. Complex numbers. Equations of higher degrees, especially cubics. Graphs of these functions. Equations of the circle, parabola and ellipse. Different equations of the straight line. Differential quotients of $y = ax^n$, $\sin x$, $\cos x$, $\tan x$, $\log x$, $y = w + v$; $v \cdot w$, $y = \arcsin x$. Stereometry. Spherical trigonometry. Orthogonal projection.

Oberprima (age 17-18).—Maxima and minima. Infinite series. Integration and summation of areas. Harmonic points and pencils. Conic sections as geometrical loci. Plane analytics. Sections of solids.

For any more extended information on this subject, see *Die Neuzeitliche Entwicklung des Mathematischen Unterrichts an den Höheren Mädchenschulen Deutschlands*, von Dr. J. Schröder, Direktor des Staatlichen Lyzeums am Lerchenfeld in Hamburg. Published by B. G. Teubner, Leipzig and Berlin, 1913.

The question arises whether we, in our country, can learn anything from the Germans concerning the mathematical training of girls. Their old curriculum, before 1908, laid too much stress on training the feeling and not enough on training the understanding.

Their present courses for girls would indicate that they believe in the girl's ability to learn mathematics, as well as in the necessity of such training, since girls there are beginning to fill the same places as boys.

We hear a great deal here in America about making the mathematics easy. Does the girl in our country need to be less well prepared along these lines? Do the Germans teach too much mathematics? Should we teach more? These are questions I shall leave to the reader to investigate.

TEACHERS COLLEGE,
NEW YORK CITY.